1,3-Dichloro-2-butene
[926-57-8]

Review of Toxicological Literature

Prepared for

Errol Zeiger, Ph.D.
National Institute of Environmental Health Sciences
P.O. Box 12233
Research Triangle Park, North Carolina 27709
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Submitted by

Raymond Tice, Ph.D. (Principal Investigator)
Brigette Brevard, M.A. (Co-Principal Investigator)
Integrated Laboratory Systems
P.O. Box 13501
Research Triangle Park, North Carolina 27709

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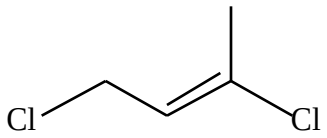
BASIS FOR NOMINATION

1,3-Dichloro-2-butene was nominated by the National Institute of Environmental Health Sciences (NIEHS) for toxicity and carcinogenicity testing based on its high U.S. production volume and potentially high human exposure.

Chemical Identification: 1,3-Dichloro-2-butene (CASRN: 926-57-8; $C_4H_6Cl_2$; mol. wt. = 125.0) is also called 1,3-dichlorobutylene and 1,3-dichlorobutene (ChemFinder, 1998; HSDB, 1998).



Physical-Chemical Properties:

Property	Information	Reference
Physical State	Clear to straw-colored liquid	Esposito (1999)
Density	1.161	Aldrich (1999)
Boiling Point (^{o}C @ 760 mm Hg)/(^{o}F)	131 (268)	Esposito (1999)
Index of Refraction (@ 20^{o}C/D)	1.4692	Aldrich (1999)
Flash Point (^{o}C, closed cup)	26.667	Esposito (1999)
Solubility	Insoluble in water; soluble in acetone, benzene, ether, and ethanol	Esposito (1999)

Uses: 1,3-Dichloro-2-butene is used as an intermediate in the production of 19-nortestosterone steroids and 2,3-dichloro-1,3-butadiene, and in chloroprene polymerization (Esposito, 1999). It also has been used in DDB (a pesticide consisting of 1,3-dichlorobutane, 1,3-dichloro-2-butene, and 3,3-dichlorobutylene) (Ekshtat et al., 1971).

Production: 1,3-Dichloro-2-butene is produced by DuPont (La Place, LA), and is commercially available from the Aldrich Chemical Company (Milwaukee, WI) as a 95% mixture of the cis and trans isomers (SRI, 1997; Aldrich, 1999). It is manufactured by the reaction of 2-chloro-1,3-butadiene with hydrochloric acid in the presence of a copper chloride catalyst (HSDB, 1998; Stewart, 1993). It is released as a by-product during chloroprene production (Stewart, 1993). Annual production is estimated to be 8 to 13 million pounds (4-6 million kg) (U.S. EPA, 1998).

Regulatory Status: No relevant U.S. government regulations were located.

Environmental: 1,3-Dichloro-2-butene can enter the environment via waste streams generated during its production or use (HSDB, 1998). It is expected to hydrolyze in moist soil and water with a half-life of 3.2 days at 25°C. In the atmosphere, it exists in the vapor phase and is degraded by reaction with hydroxy radicals; its atmospheric half-life is ~28 hours.

Human Exposure: Exposure can occur via inhalation of vapors or dermal contact (HSDB, 1998). No data on the number of potentially exposed workers were located.

Toxicological Data: In rats, the 4-hour LC_{50} has been reported to be 546 mg/m^3 (4.37 mmol/m^3; 107 ppm) or 3,930 mg/m^3 (31.4 mmol/m^3; 769 ppm) (Clary, 1997; Esposito, 1999). In mice, the 2-hour LC_{50} is 4,400 mg/m^3 (35.2 mmol/m^3; 861 ppm) (Esposito, 1999).

A single oral dose (100 and 300 mg/kg; 0.8 and 2.40 mmol/kg) was nephrotoxic in male and female rats (Petrosyan and Gizhlaryan, 1985). In rats, a 4-hour inhalation exposure to 850 mg/m^3 (6.8 mmol/m^3; 166 ppm) caused changes in urine composition, pigmented or nucleated red blood cells, and weight loss (strain and age not provided) (RTECS, 1998). Rats and rabbits (strains and ages n.p.) exposed to 100 mg/m^3 (0.8 mmol/m^3; 19.6 ppm) for 6 hours had central nervous system (CNS) effects and changes in liver and blood chemistries. Rabbits exposed dermally to 0.5 mL (0.6 g; 5 mmol) for 24 hours became unsteady and drowsy (DuPont, 1970). 1,3-Dichloro-2-butene is a moderate to severe skin irritant and lacrimator in rabbits (Clary, 1977; DuPont, 1970).

In rats and rabbits, subchronic inhalation exposure (6 hours/day for 3-6 months) to 1,3-dichloro-2-butene at a concentration of 0.01-0.1 mg/L (2-20 ppm; 10-100 mg/m^3; 0.08-0.8 mmol/m^3) caused capillary damage, pulmonary emphysema, and necrobiotic changes in the myocardium, liver, kidney, and spleen (Oganesyan and Akopdzhanyan, 1969; Gasparyan and Barsegyan, 1970).

1,3-Dichloro-2-butene was not mutagenic in *Salmonella typhimurium* (strains n.p.) in the Ames test (unpublished DuPont data; cited by Clary, 1977).

No toxicokinetics, reproductive, carcinogenicity, or immunotoxicity data were located.

SAR: The toxicity of chlorinated butenes is dependent on the position and number of Cl atoms (Gizhlaryan, 1981). Among the dichlorobutenes, 1,4-dichloro-2-butene, which has Cl atoms in the terminal positions, was the most toxic. 1,3-Dichloro-2-butene and 3,4-dichlorobutene-1 have only 1 terminal Cl atom and were less toxic.

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